**What is Claimed is:**

1. A system for detecting neural events comprising:

a neural event electrode interface that is configured to communicate with electrodes that capture electrical signals that are associated with at least one neuron;

a neural event waveform processor that is configured to extract neural events from the electrical signals; and

a wireless transmitter that is configured to wirelessly transmit the neural events that are extracted from the electrical signals.

2. A system according to Claim 1 wherein the neural event waveform processor is configured to extract neural events from the electrical signals by performing time/amplitude window discrimination of the electrical signals.

3. A system according to Claim 1 wherein the neural event waveform processor is configured to extract neural events from the electrical signals by applying template matching to the electrical signals.

4. A system according to Claim 1 wherein the neural event waveform processor is further configured to time-stamp the neural event and wherein the wireless transmitter is configured to wirelessly transmit the neural events that are extracted from the electrical signals and associated time-stamps.

5. A system according to Claim 1 wherein the neural event waveform processor is further configured to identify a neuron that is responsible for the neural event and wherein the wireless transmitter is configured to wirelessly transmit the neural events that are extracted from the electrical signals and associated neuron identification.

6. A system according to Claim 1 wherein the neural event waveform processor is configured to extract neural events from the electrical signals by detecting occurrence of a neural event in the electrical signals and by assigning the neural event to a category, and wherein the wireless transmitter is configured to wirelessly transmit the neural events that are extracted from the electrical signals by transmitting the category.

7. A system according to Claim 1 further comprising a wireless receiver that is configured to wirelessly receive instructions for configuring the neural event waveform processor and to provide the instructions to the neural event waveform processor.

8. A system according to Claim 1 further comprising a wireless receiver that is configured to wirelessly receive neural stimulation waveforms and to provide the neural stimulation waveforms to the neural event electrode interface.

9. A system according to Claim 1 wherein the neural event waveform processor is further configured to generate neural stimulation waveforms and to provide the neural stimulation waveforms to the neural event electrode interface.

10. A system according to Claim 1 further comprising a housing, wherein the neural event electrode interface, the neural event waveform processor and the wireless transmitter are contained within and/or on the housing.

11. A system according to Claim 10 wherein the housing is about 5 cubic centimeters in volume.

12. A system according to Claim 1 wherein the neural event waveform processor comprises:

a plurality of amplifiers that are connected to the neural event electrode interface;

a plurality of analog to digital converters, a respective one of which is responsive to a respective one of the amplifiers; and

a digital signal processor that is responsive to the analog to digital converters;

wherein the wireless transmitter is responsive to the digital signal processor.

13. A system according to Claim 1 wherein the electrical signals that are associated with at least one neuron are generated by at least one neuron, a collection of neural tissues, brain regions and/or *in vitro* brain slices.

14. A system according to Claim 1 wherein the electrical signals that are associated with at least one neuron are generated by an *in vitro* sample.

15. A system according to Claim 1 wherein the electrical signals that are associated with at least one neuron are generated by an *in vivo* subject.

16. A system according to Claim 1 wherein the electrical signals that are associated with at least one neuron are generated by at least one neuron, in conjunction with experimentally relevant externally applied stimuli; in conjunction with genetic manipulation; before, during and/or after administration of a drug or chemical agent; and/or in conjunction with a feedback control interface to a prosthesis or other neural interface.

17. A system according to Claim 1 further comprising a base station that is configured to wirelessly receive the neural events that are transmitted by the wireless transmitter and to further process the neural events that are wirelessly received.

18. A system according to Claim 17 further comprising a plurality of neural event waveform processors and wireless transmitters, and wherein the base station is configured to wirelessly receive the neural events that are transmitted by a plurality of the wireless transmitters and to further process the neural events that are wirelessly received.

19. A method for detecting neural events comprising:

capturing electrical signals that are associated with at least one neuron; then

extracting neural events from the electrical signals; and then

wirelessly transmitting the neural events that are extracted from the electrical signals.

20. A method according to Claim 19 wherein extracting comprises performing time/amplitude window discrimination of the electrical signals.

21. A method according to Claim 19 wherein extracting comprises applying template matching to the electrical signals.

22. A method according to Claim 19 wherein extracting comprises:

detecting occurrence of a neural event in the electrical signals; and

assigning the neural event to a category; and

wherein wirelessly transmitting comprises wirelessly transmitting the assigned category.

23. A method according to Claim 19 further comprising wirelessly receiving instructions for extracting neural events from the electrical signals.

24. A method according to Claim 19 further comprising wirelessly receiving neural stimulation waveforms.

25. A method according to Claim 19 wherein the at least one neuron comprises a neuron, a collection of neural tissues, brain areas and/or *in vitro* brain slices.

26. A method according to Claim 19 wherein the at least one neuron comprises an *in vitro* sample.

27. A method according to Claim 19 wherein the at least one neuron comprises an *in vivo* subject.

28. A method according to Claim 19 wherein the electrical signals that are associated with at least one neuron are generated by at least one neuron, in conjunction with experimentally relevant externally applied stimuli; in conjunction with genetic manipulation; before, during and/or after administration of a drug or chemical agent; and/or in conjunction with a feedback control interface to a prosthesis or other neural interface.

29. A method according to Claim 19 further comprising:

wirelessly receiving the neural events that are wirelessly transmitted; and

further processing the neural events that are wirelessly received.

30. A system for detecting neural events comprising:

means for communicating with electrodes that capture electrical signals that are associated with at least one neuron;

means for extracting neural events from the electrical signals; and

means for wirelessly transmitting the neural events that are extracted from the electrical signals.